

Cadmium Aquatic Life Ambient Water Quality Criteria
Briefing for ACWA Monitoring, Standards & Assessment Committee
January 20, 2016

I. Overview of 2015 Draft Cadmium Aquatic Life Criteria Update

- Current draft criteria update revises acute and chronic freshwater and estuarine/marine criteria
- Values were last updated in 2001; revisions were also conducted in 1996, 1985 and the original criteria dating back to 1980
- Criteria revisions are based on new toxicity test data; no major changes in scientific approach (Table 1);
- Have substantially more data

Table 1. Number of tested aquatic species included in criteria derivation over time

	Freshwater Acute	Freshwater Chronic	Estuarine/Marine Acute	Estuarine/Marine Chronic
1980	29	13	31	1
2001	65	21	61	2
2015	101	27	94	2

- Based on the amount of data, we were able to derive acute and chronic freshwater values and estuarine/marine acute values using a sensitivity distribution (minimum requirements met – 8 taxa for acute; 3 for chronic values)
- Exception is for estuarine/marine chronic where we used an Acute-to-Chronic ratio based on availability of chronic marine values (data were available for mysid shrimp)
 - *ACR ratio was developed based on 7 genus-level ACRs: five freshwater fish species, three freshwater invertebrate species, two acutely sensitive mysid species*
- Freshwater acute and chronic are hardness-dependent (as in previous revisions)
- Direct exposure effects to aquatic animals remains focus of evaluation
 - Direct exposure effects occur at lower concentrations than bioaccumulation effects
- Criteria values are very close to what they were in 2001, indicating previous criteria were robust
 - Freshwater (based on a hardness of 100 mg/L as CaCO₃)
 - Draft acute value increases from 2.0 in 2001 to 2.1 ug/L
 - Lowered to protect the commercially and recreationally important rainbow trout, as per the 1985 Guidelines. Acute value prior to lowering is 3.0 µg/L.
 - Draft chronic value increases from 0.25 to 0.73 ug/L
 - Saltwater
 - Draft acute value decreases from 40 to 35 ug/L
 - Draft chronic value decreases from 8.8 to 8.3 ug/L

Table 2. 2015 updated criteria values compared to the existing 2001 current criteria, based on a hardness equation

Waterbody Type	2015 AWQC Update (dissolved cadmium in µg/L)	2001 AWQC Update (dissolved cadmium in µg/L)
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	Acute (1-hour)	Chronic (4-day)	Acute (1-day)	Chronic (4-day)
Freshwater (Total Hardness = 100 mg/L as CaCO ₃)	2.1 ^a	0.73	2.0 ^a	0.25
Estuarine/marine	35	8.3	40	8.8

^a Lowered to protect the commercially and recreationally important rainbow trout, as per the 1985 Guidelines, Stephen et al. Acute value prior to lowering is 3.0 µg/L.

- **Current Status**
 - The criteria document is currently out for 60 day public comment
 - The comment period will end on February 1st.
 - Prior to this draft publication the draft criteria document has undergone
 - Two separate Agency reviews
 - One contractor led external expert peer review
 - Comments and response to comments from the expert peer review are posted in the docket
 - The cadmium draft 304(a) criteria targeted for finalization on March 30, 2016

II. Detailed information on sensitive species and new data

1. Freshwater Criteria Development

A. Acute

- i. Fish (primarily salmonids) are drivers of the acute criterion value
- ii. 75 freshwater genera for acute toxicity (compared to 55 in 2001)
 - a. Most of the new genera are invertebrates (14 of 19 added genera)

Table A1. Most acutely sensitive freshwater aquatic organisms tested (ranked most to least sensitive)

Rank	Species	GMAV (µg/L)
1	Bull Trout	4.750
2	Mottled Sculpin	4.926
3	Striped Bass	5.883
4	Brown Trout	6.066
5	Chinook Salmon (SMAV = 9.888 µg/L)	7.841
	Rainbow Trout (SMAV = 4.468 µg/L)	
	Coho Salmon (SMAV = 14.34 µg/L)	
	Cutthroat Trout (SMAV = 5.966 µg/L)	

B. Chronic

- i. Invertebrates are drivers of chronic value

- ii. 20 freshwater genera for chronic toxicity (compared to 16 in 2001)
- iii. 3 of 4 newly-added genera are invertebrates
 - a. Benthic worm (*Lumbriculus*)
 - b. Freshwater snail (*Lymnaea*)
 - c. Freshwater mussel (*Lampsilis*)
 - d. Freshwater fish- sculpin (*Cottus*)

Table A2. Most chronically sensitive freshwater aquatic organisms tested

Rank	Species	GMCV (µg/L)
1	Amphipod, <i>H. azteca</i>	0.7454
2	Cladoceran, <i>Ceriodaphnia</i>	1.293
3	Mottled sculpin	1.721
4	Midge, <i>Chironomus</i>	2.000

2. Estuarine/Marine Criteria Development

A. Acute

- i. Invertebrates are the most sensitive species
 - A. Three invertebrates and striped bass (*Morone saxatilis*) are drivers of FAV, with moon jellyfish (*Aurelia aurita*) newly-added to the calculation of FAV
- ii. 79 estuarine/marine genera for acute toxicity (compared to 54 in 2001)
 - A. Most of the added genera are invertebrates (20 of 24 added genera)
- iii.
- iv. Estuarine/marine acute value decreased from 40 µg/L to 35 µg/L based primarily on addition of two of the new genera
 - a. Opossum shrimp (*Neomysis*)
 - b. Moon jellyfish (*Aurelia*)

Table A3. Most acutely sensitive saltwater aquatic organisms tested

Rank	Species	GMAV (µg/L)
1	Harpacticoid copepod (<i>Tigriopus brevicornis</i>)	29.14
2	Moon jellyfish (<i>Aurelia aurita</i>)	61.75
3	Mysid (<i>Neomysis integer</i>)	65.25
4	Mysid (<i>Americamysis bahia</i> and <i>bigelowi</i>)	67.39
5	Striped bass (<i>Morone saxatilis</i>)	75.0

B. Chronic

- i. No new chronic toxicity data available since 2001
- ii. Estuarine/marine CCC increased from 8.8 µg/L to 11 µg/L based primarily on a decrease in the acute-chronic ratio with the incorporation of two freshwater species in the acute-to-chronic ratio
 - a. Mottled sculpin (*Cottus bairdii*)
 - b. Fatmucket clam (*Lampsilis siliquoidea*)

Table A4. Saltwater aquatic organisms tested for chronic effects

Rank	Species	GMCV (µg/L)
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1	Mysid (<i>Americamysis bahia</i> and <i>bigelowi</i>)	8.449
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